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Radiation Fields, Effects and Risks in Human Space Missions (5)

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EXTREME SOLAR EVENT OF AD775: POTENTIAL RADIATION EXPOSURE TO CREWS IN
DEEP SPACE**Abstract**

The existence of a historically large cosmic event in AD774 or 775, of probable solar origin, has recently been confirmed from records of ^{14}C levels in tree rings located at widely separated locations on Earth, ^{10}Be records in polar ice cores, and historical records of aurora sightings. Usoskin et al (Astronomy Astrophysics, 2013) suggest that such an event, of solar origin, would have a proton fluence of approximately $4.5 \times 10^{10} \text{ cm}^{-2}$ at energies above 30 MeV, with a hard energy spectrum comparable to the event of 23 February 1956. In this work we investigate the possible radiation exposures to crews of missions in deep space, on the lunar surface, and on the surface of Mars, from such an event. In this work we use the HZETRN radiation transport code, originally developed at NASA Langley Research Center, and the Computerized Anatomical Male and Female human geometry models to estimate exposures for a variety of aluminum shield areal densities similar to those provided by an interplanetary spacecraft, and a spacesuit, surface lander, and permanent habitat on the lunar or Martian surface. Comparisons of the predicted organ exposures with NASA Permissible Exposure Limits (PELs) are made. Potential health effects on crews, of such an event, are also discussed.